Correlation between Apolipoprotein B (Apob) Level and Non Alcoholic Fatty Liver in Type 2 Diabetes Mellitus with Metabolic Syndrome

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ABSTRACT

***Background**: Non-alcoholic fatty liver disease (NAFLD) is a liver disorder commonly found in the majority of patients with metabolic risk factors, such as obesity and type 2 diabetes. Apolipoprotein B (apoB) is the moiety of low density lipoprotein (LDL) and clinical interest that provides a relative accurate estimation of circulating LDL particle. The aim of this study was to know the relationship between apoB level and occurrence of fatty liver in type 2 diabetes mellitus (DM) with metabolic syndrome.*

***Method:** A cross sectional study was conducted in patients suffered from type 2 DM with metabolic syndrome at Internal Medicine Outpatient Clinic in Moewardi Hospital Surakarta between April and May 2011. Thirty two patients with type 2 DM and metabolic syndrome were enrolled to this study and categorized into two groups; consisting of 16 patients with fatty liver and 16 patients without fatty liver. Student t-test was used in the analysis of this study.*

***Results**: Of 32 patients who fulfilled this study criteria, patients type 2 diabetes mellitus and metabolic syndrome with non-alcoholic fatty liver diseases (NAFLD) had higher apoB level than patients type 2 diabetes mellitus and metabolic syndrome without NAFLD (p = 0.013).*

***Conclusion**: NAFLD group had significantly higher apoB level than without NAFLD group in type 2 DM with metabolic syndrome patients.*

***Keywords:** apolipoprotein B, non-alcoholic fatty liver disease, type 2 DM, metabolic syndrome*

ABSTRAK

***Latar belakang**: Perlemakan hati non alkoholik merupakan penyakit hati yang sering terjadi pada sebagian besar dari pasien yang mempunyai faktor risiko metabolik seperti obesitas dan diabetes tipe 2. Apolipoprotein B (ApoB) adalah bagian dari lipoprotein berdensitas rendah dan secara klinis dapat memperkirakan akurasi relatif dari sirkulasi partikel lipoprotein densitas rendah. Penelitian ini bertujuan untuk mengetahui hubungan antara kadar apolipoprotein B dengan terjadinya perlemakan hati pada pasien diabetes mellitus (DM) tipe 2 dengan sindroma metabolik.*

***Metode**: Desain penelitian potong lintang dilakukan pada 32 pasien rawat jalan bagian Penyakit Dalam Rumah Sakit Moewardi Surakarta pada bulan April-Mei 2011 yang menderita penyakit DM tipe 2 dengan sindroma metabolik. Total pasien tersebut dikatagorikan menjadi 2 kelompok, yaitu 16 pasien dengan perlemakan hati dan 16 pasien tanpa perlemakan hati. Penelitian ini dianalisis dengan menggunakan student t-test.*

***Hasil:** Dari 32 pasien yang memenuhi kriteria penelitian, pasien DM tipe 2 dan sindroma metabolik dengan perlemakan hati mempunyai kadar apoB lebih tinggi dibandingkan pasien DM tipe 2 dan sindroma metabolik tanpa perlemakan hati (p < 0,013).*

Kesimpulan: *Kelompok perlemakan hati memiliki kadar apolipoprotein B (apoB) yang signifikan lebih tinggi dari kelompok bukan perlemakan hati pada tipe 2 dengan sindroma metabolik.*

Kata kunci: *apolipoprotein B, perlemakan hati non-alkoholik, DM tipe 2, sindroma metabolik*

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is a common liver disorder, frequently identified in individuals who have absence of significant alcohol consumption. Although a number of circumstances have been implicated as risk factors, obesity is clearly the principal risk factor in the development of NAFLD.[1] The prevalence of NAFLD in the general population is up to 30%; however, this is strongly associated with obesity, insulin resistance, hypertension and dyslipidemia and is now regarded as the liver manifestation of the metabolic syndrome.[2,3]

Lipid accumulation in the liver is the major hallmark of NAFLD. Fatty liver-associated dyslipidemia profile characterized by large very low density lipoprotein (VLDL), small dense low density lipoprotein (LDL), and decreased large high density lipoprotein (HDL) correlates with intrahepatic lipid content.[4]

Apolipoproteins are important structural and functional proteins in lipoprotein particles, which transport lipids. Plasma apolipoprotein B has recently been closely associated with metabolic syndrome. Apolipoprotein B (ApoB) is the primary apolipoprotein of LDL-c, which is responsible for carrying cholesterol to tissues. ApoB measurement has many advantages. It does not require any fasting blood sample. It is a direct measurement. This means that there is no need for calculation from multiple parameters, which may introduce errors.[5,6] The aim of this study was to know the correlation between apoB level and occurrence of fatty liver in type 2 diabetes mellitus with metabolic syndrome.

METHOD

A cross sectional study was conducted in 32 patients suffered from type 2 DM with metabolic syndrome between April and May 2011, using data from an Internal Medicine Outpatient Clinic in Moewardi Hospital, Surakarta. A total of 32 patients were recruited and, categorized into two groups, consisting of 16 patients with NAFLD and 16 patients without NAFLD. Diagnosis of diabetes mellitus was made according to Consensus of Management and Prevention of Type 2 Diabetes Mellitus Indonesia 2006 including:[7] physical examination, laboratory findings, and medications. Metabolic syndrome was defined based on the criteria provided by the ATP III. The exclusion criteria were patients who had previous history of chronic liver disease, positive hepatitis viral sero-marker, or history of alcohol consumption.

The blood pressure was measured on the right arm using sphygmomanometer. Hypertension was defined as systolic blood pressure > 140 mmHg and/or diastolic blood pressure > 90 mmHg, or was considered to be present if patient had been treated with antihypertensive drugs before. Fasting blood sugar was measured after 8 hours fasting, followed by measurements of high density lipoprotein cholesterol and, triglycerides. ApoB is measured by immunoturbidimetric method from dr. Moewardi Hospital laboratory.

Ultrasonographic examination of the liver was performed to detect fatty change in the liver. Described as hepatic fat is increased echogenicity on ultrasound, compared with the lower echogenicity of the spleen or renal cortex (bright liver). Data analysis was performed using student t-test with SPSS program.

RESULTS

Of 32 total patients, 17 (54%) were female and all of them had type 2 DM and we continued the study with variables of metabolic syndrome. The characteristics were age, sex, type 2 DM, and metabolic syndrome criteria (ATP III criteria). The clinical characteristics of patients were detailed in Table 1.

Table 1. Patients' characteristic

Characteristic	n (%)
Mean of age (years)	56.6
Sex	
Male	15 (46%)
Female	17 (54%)
Type 2 diabetes mellitus	32 (100%)
Metabolic syndrome criteria	
Central obesity (waist circumference)	24 (75%)
Hypertriglyseride	18 (56%)
Low HDL-C	23 (71%)
Hypertension	20 (62%)
Elevated fasting plasma glucose	18 (56%)
Apolipoprotein B (mean ± SD)	
Fatty liver (+)	111.7 ± 26
Fatty liver (-)	169.6 ± 79

HDL: high density lipoprotein; SD: standard deviation

ApoB level were significantly higher in type 2 DM and metabolic syndrome patients with fatty liver than

in type 2 DM and metabolic syndrome patients without fatty liver ($p < 0.013$), as seen in Figure 1.

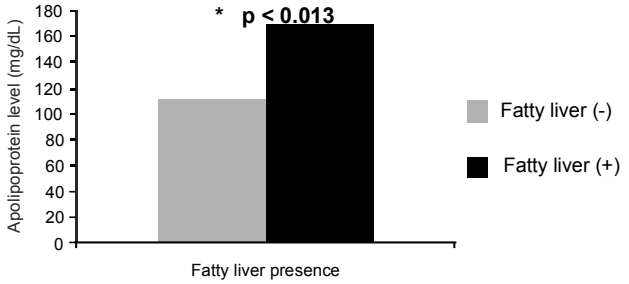

Figure 1. Relationship between patient with or without fatty liver and apolipoprotein B (apoB) level

DISCUSSION

Non-alcoholic fatty liver disease (NAFLD) is common, and its prevalence is likely to increase with the rising incidence of obesity and diabetes. It is present in up to one-third of the general population and in the majority of patients with metabolic risk factors, such as obesity and diabetes. The associations between obesity and fatty liver are well documented.[1,8,9]

The liver plays a central role in lipid metabolism, storing and exporting lipids and lipoproteins. Lipid accumulation in the liver is the major hallmark of NAFLD. Abnormalities in lipid and lipoprotein metabolism accompanied by chronic inflammation are considered to be the central pathway for the development of several obesity-related co-morbidities, such as NAFLD. In NAFLD patients, liver overproduces several atherogenic factors, such as cytokines and "bad" lipoproteins.[4,10]

ApoB is the primary apolipoprotein of LDL-c, responsible for carrying cholesterol to tissues. ApoB is present as a single molecule in low, intermediate, and very low density lipoproteins (LDL, IDL and VLDL). The clinical interest of this protein lies in the fact that it provides a relative accurate estimation of circulating LDL.[11-14]

We used liver ultrasound to detect hepatic fat accumulation. The gold standard for fatty liver is liver biopsy but liver ultrasound was therefore used as an alternative validated method to detect hepatic fat accumulation. A positive ultrasound result in association with metabolic risk factors is likely to be adequate for establishing diagnosis.

Previous Korean study by Seung et al, reported that the development of NAFLD was associated with elevated measurements of waist circumference, fat mass, percentage of body fat and abdominal fat, iron, triglycerides, and apoB.[1] In another study, from Onat et al confirmed that Apo B concentration, which reflected the number of small, dense LDL particles in plasma, was a significant predictor of cardiometabolic risk among adults with a high prevalence of metabolic syndrome.[6]

In this study we compared apoB level in type 2 DM and metabolic syndrome patients with or without NAFLD. The results of this study revealed that the level of apoB was significantly higher in type 2 DM and metabolic syndrome patients with NAFLD than in type 2 DM and metabolic syndrome patients without NAFLD. These results suggested that apoB could be used as an alternative risk marker in type 2 DM and metabolic syndrome patients for NAFLD. However, we considered the possibility that the sample analyzed in this study was not representative. Further investigative studies with bigger sample size are need in the future.

CONCLUSION

Type 2 diabetes mellitus and metabolic syndrome in patients with NAFLD has higher apob level than type 2 diabetes mellitus and metabolic syndrome in patients without NAFLD.

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